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**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY
REMEDICATION FOR POLLUTED GROUND WATER AROUND KOCHUVELI
INDUSTRIAL AREA**

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ABSTRACT

Clean water is one of the most valuable resources in our planet. Water is a basic element of social and economic infrastructure and is essential for healthy society and sustainable development. Due to rapid increase in density of population, urbanization and industrialization the demand of water is increasing day by day. Quantity of ground water is decreasing considerably as industrial wastes are being discharged into the surrounding areas. Quantity of drinking water have great importance, this thought inspired us to conduct this project.

The study aimed to assess the suitability of the groundwater as well waters around an industry for domestic purposes. The study area chosen is industrial area of KOCHUVELI. The sample water was collected from the open wells around the project area. The main physio-chemical analysis of the parameters like turbidity, conductivity, pH, acidity, chlorides, dissolved oxygen, total solids, iron, COD, BOD etc., were conducted. The variation in characteristics along with the distance from the industry are analysed and concluded that water is polluted. We concluded that well water is polluted due to the discharge of effluents from industries. A composite media filter prototype was made using activated carbon, gravel, geotextiles, manganese dioxide, fine sand for filtration purpose.

KEYWORDS: Water quality analysis, Composite media filter prototype construction.

1. INTRODUCTION

Water is an essential natural resource for sustaining life and environment that we have always thought to be available in abundance and the free gift of nature. However, the chemical composition of surface and the subsurface water is one of the prime factors on which the suitability for domestic, industrial or agriculture purpose depends. Natural, readily available water such as shallow groundwater, surface water, water from the boreholes and springs are the main sources for drinking water production. Locally, the quality of ground water has been degraded. Municipal and industrial wastes have entered the soil, infiltrated some aquifers, and degraded the ground-water quality. Quality of ground water is decreasing considerably as industrial wastes are discharged into the surrounding area.

In this paper, we aimed to analyze the water quality parameters of ground water around the Kochuveli industrial area and to design a suitable filter media prototype for the filtration of the polluted ground water. Many industries including Titanium Dioxide manufacturing Enterprises are located here. The quality of ground water is deteriorating at a faster pace due to industrial wastes being discharged into the surrounding areas and the effluents from some factories are directed into the sea. People around this industrial area mainly depend on ground water and tap water, particularly for their domestic purpose. So it is significant to check the ground water contamination. Water quality parameters like pH, turbidity, electrical conductivity, total solids, dissolved oxygen, BOD, COD, iron, chlorides and acidity were analyzed and a filter media prototype were designed.

2. MATERIALS AND METHODS

2.1 Study Area Selection

The investigation was carried out by selecting ten open well samples representing different localities around Kochuveli industrial area, Thiruvananthapuram. The area was totally affected by the effluents from industries.

2.2 Sampling

Ten open well samples were collected within a range of 3 km around Kochuveli industrial area. All the samples were collected in 2 liters cans and preserved. Tests like pH, turbidity, electrical conductivity, total solids, iron, dissolved oxygen, BOD, COD, chlorides and acidity were conducted within 3 days of sample collection.

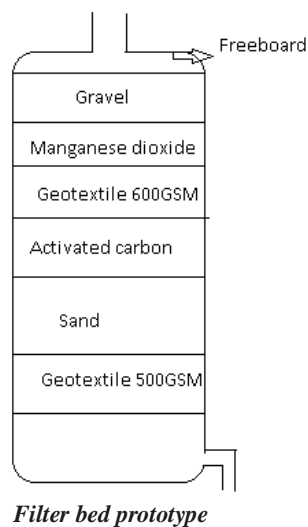
2.3 Test Procedure

pH and turbidity tests were conducted using pH meter and turbidimeter respectively. Iron and electrical conductivity tests were conducted using spectrophotometer and conductivity meter. All the tests were conducted as per IS standards.

2.4 Filtration of samples

As per the water quality analysis results, materials like gravels, sand, activated carbon, manganese dioxide and geotextiles were used in the filter media prototype. These materials were arranged in various thickness and the filtrated water was tested for each thickness. The one giving best results in filtration was selected and results were analyzed before and after filtration.

Figure:



3. RESULTS AND DISCUSSION

By using this filterbed, changes in water quality parameters like iron, turbidity, COD and total solids were noticed.

A. Analysis of pH

The pH ranges from 5.2 to 6.7. The samples S3, S4, S5 and S10 are safe for use and all other samples shows slightly acidic nature.

B. Analysis of Conductivity

Conductivity varies from 532.7 to 1782($\mu\text{m}/\text{cm}$). It is clear from the table that conductivity decreases from S1 to S5 and from S6 to S10.

C. Analysis of Turbidity

The turbidity varies from 2.3 to 7.2(NTU). Water is more turbid in the nearby areas.

D. Analysis of Iron.

The permissible limit of iron is 0.3 mg/l. It is clear that their values are beyond the limit for all samples and it varies from 0.42 to 3.12 (mg/l). Most of the samples have high iron content.

E. Analysis of Chlorides.

Chlorides varies from 59.14 to 273.442(mg/l). Presence of chlorine decreases from S1 to S5 and from S6 to S10.

F. Analysis of BOD.

BOD present in the sample varies from 0.768 to 1.167(mg/l). As the distance from industries increases BOD values decreases.

G. Analysis of DO.

Dissolved oxygen present in the sample ranges from 2.21 to 6.01(mg/l). The DO present in the nearby samples are very less and increases when the distance increases.

H. Analysis of COD

Chemical oxygen demand present in the sample ranges from 16 to 64(mg/l). This decreases with increase in distance from the effluent channel.

I. Analysis of Acidity

Acidity varies from 18 to 34(mg/l). The value of acidity decreases with increase in distance from the effluent channel.

J. Analysis of solids

Total solids varies from 720 to 2300(mg/l). It decreases with increase in distance from the effluent channel.

Tables:*Table 9. Sample stations*

Sample no	Distance From Effluent Channel(Km)	Latitude	Longitude
S1	0.470	8.4957°	76.89745°
S2	0.422	8.49668°	76.90055°
S3	0.574	8.49688°	76.9029°
S4	0.890	8.49512°	76.90492°
S5	1.87	8.49416°	76.91435°
S6	0.336	8.49856°	76.89565°
S7	0.425	8.50199°	76.8954°
S8	0.608	8.50354°	76.8946°
S9	1.01	8.50573°	76.89172°
S10	2.014	8.51248°	76.88421°

Table 10. Results of pH, Conductivity, Turbidity, Iron, Chloride

Sample No.	pH	Conductivity(µs/cm)	Turbidity(NTU)	Iron(mg/l)	Chloride(mg/l)
S1	5.3	1782	6.8	3.12	263.99
S2	5.8	1520	5.7	2.07	248.99
S3	6.1	1096	4.8	1.63	198.55
S4	6.4	532.7	3.3	1.41	159.64
S5	6.7	354.8	2.4	0.55	91.947

S6	5.2	1726	7.2	2.92	273.442
S7	5.32	1688	6.4	1.492	261
S8	5.5	537.2	5.3	1.55	169.74
S9	5.83	427.4	3.8	1.23	74.82
S10	6.3	532.7	2.3	0.42	59.14

Table 11. Results of BOD, DO, COD, Acidity, Solids

Sample No.	BOD(mg/l)	DO(mg/l)	COD(mg/l)	Acidity(mg/l)	Solids(mg/l)
S1	1.167	2.21	64	34	2300
S2	1.1187	3.39	52	28	2200
S3	1.07	4.33	32	26	1450
S4	1.019	5.71	28	22	1230
S5	0.959	6.01	18	20	830
S6	1.15	2.69	62	34	2300
S7	1.093	3.78	48	30	1930
S8	0.948	4.532	30	26	1310
S9	0.871	5.95	26	24	980
S10	0.768	5.9	16	18	720

4. CONCLUSION

All the well water near Kochuveli industrial area exhibited high COD, TDS, iron, turbidity etc. which are sourced to industrial wastes being discharged into the surrounding areas. The values of BOD, TDS, turbidity, and iron exceeded the permissible limit. Hence the well water near the area is unsuitable for the domestic purpose as confirmed by the water quality index. The consumption of the well water near the industrial area may cause health hazards to the local residents. Therefore it is necessary to control the contaminant transportation and ground water pollution in and around Kochuveli. By using this filter media prototype, iron was reduced by 67.564%, turbidity by 68.97%, COD by 95.625%, total solids by 76.09%.

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